

What is claimed is:

1. An optical odometer system for measuring travel over a surface, comprising:

an electronic image sensor having freedom of motion parallel to said surface in at least one dimension;

optics coupled to said image sensor so as to image a portion of said surface onto said image sensor at a known scale factor;

an analog-to-digital converter for converting a sensed image to digital form;

computer memory for storing data derived from sequentially captured digital images;

a clock oscillator for providing a time reference; and

distance calculating means for calculating distance traveled with respect to said surface between sequentially captured digital images.

2. The optical odometer system of claim 1, further comprising orientation calculation means for calculating orientation changes between said sequentially captured digital images.

3. The optical odometer system of claim 1, further comprising an optically detectable fiducial mark, and means for automatically sensing position relative to said fiducial mark.

4. The optical odometer system of claim 1, wherein said surface comprises the floor of a product storage area and further comprises a fiducial mark, and wherein said electronic imager and said optics are affixed to a product

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transport mechanism, and further comprising means for automatically sensing the presence of said fiducial mark and means for subsequently measuring position relative to said fiducial mark.

5. A method of optical odometry comprising the steps of:
mounting optics operably coupled to an electronic imager on a mobile object capable of motion with at least one degree of freedom parallel to a surface, such that said optics focus an image of a portion of said surface onto said electronic imager at a known scale factor, said portion of said surface varying with the position of said object;

acquiring a sequence of electronic images at known times through said imager;

converting said sequence of electronic images to a sequence of data sets; and

digitally processing said sequence of data sets in conjunction with said scale factor to measure distance traveled by said object in at least one dimension.

6. The optical odometer system of claim 2, wherein said optics comprise a substantially telecentric lens.

7. The optical odometer system of claim 2, further comprising means for measuring changes in the distance of said optics from said surface over time.

8. The optical odometer system of claim 2, further comprising means for stabilizing the distance of said optics from said surface over time.

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9. A method of providing automated shopping assistance, comprising:

using an optical odometer attached to a shopping cart to track motion of said shopping cart through a retail store; and

displaying information of potential use to a consumer through a display on said shopping cart.

10. The method of claim 9, further comprising the step of receiving an information request from a consumer and automatically displaying information in response to said information request.

11. The method of claim 9, further comprising the step of receiving a shopping list of items from a consumer in electronic or barcode form and displaying information of potential use to said consumer regarding said items.

12. The method of claim 9, wherein said information of potential use to said consumer comprises advertising information dependent on the position of said consumer within said store.

13. The method of claim 10, wherein said information of potential use to said consumer comprises advertising information related to an information request made by said consumer.

14. The method of claim 11, wherein said information of potential use to said consumer comprises advertising information related to a shopping list input by said consumer.

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15. The method of claim 11, wherein said information of potential use to said consumer comprises location information regarding said items.

16. An optical odometer system for measuring travel over a surface, comprising:

an integrated optical navigation sensor having freedom of motion parallel to said surface in at least one dimension;

optics coupled to said image sensor so as to image a portion of said surface onto said electronic image sensor at a known scale factor;

a clock oscillator for providing a time reference; and

distance calculating means for calculating distance traveled with respect to said surface based data output from said integrated optical navigation sensor.

17. The optical odometer system of claim 16 wherein said optics comprise a substantially telecentric lens.

18. A method of optical odometry comprising the steps of:

mounting optics operably coupled to an integrated navigation sensor on a mobile object capable of motion with at least one degree of freedom parallel to a surface, such that said optics focus an image of a portion of said surface onto said electronic imager at a known scale factor, said portion of said surface varying with the position of said object, and said image being of a known scale relative to said portion of said surface; and

digitally processing data output from said optical navigation sensor to derive distance traveled by said object in at least one dimension.

19. The method of claim 18, further comprising digitally processing data output from said integrated navigation sensor to derive velocity of said object in at least one dimension.

20. The optical odometer system of claim 4, wherein said product storage area comprises a retail store which includes a checkout counter, and wherein said product transport mechanism comprises a shopping cart.

21. The optical odometer system of claim 20, further comprising a wireless data link, a database containing positional information for products within said store, automated product identification equipment at said checkout counter, and means affixed to said shopping cart for displaying the location of products within said store.

22. The optical odometer system of claim 21, further comprising means for deriving and storing a digital representation of a path traversed by said shopping cart in said retail establishment.

23. The optical odometer system of claim 22, further comprising means for storing timing information about the movement of said shopping cart along said path through said retail establishment.

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24. The optical odometer system of claim 1 wherein said optics comprise a substantially telecentric lens.

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